

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (Currently Amended)

A substrate treatment apparatus for removing an unnecessary substance from a surface of a substrate, the apparatus comprising:

an oxidation liquid supply mechanism including an oxidation liquid nozzle for supplying an oxidation liquid having an oxidative effect to the substrate surface;

a physical cleaning mechanism including a dual fluid spray nozzle for blowing a gas on a treatment liquid ejected toward the substrate surface to generate a jet flow of droplets of the treatment liquid and supplying the jet flow to the substrate surface; and

an etching liquid supply mechanism including an etching liquid nozzle for supplying an etching liquid having an etching effect to the substrate surface;

further comprising a cleaning controller for controlling the oxidation liquid supply mechanism and the physical cleaning mechanism to supply the jet flow of droplets to the substrate surface from the dual fluid spray nozzle while supplying the oxidation liquid to the substrate surface from the oxidation liquid nozzle.

Claims 2-3 (Canceled)

Claim 4 (Previously Presented)

A substrate treatment apparatus as set forth in claim 1, wherein the physical cleaning mechanism further includes an ultrasonic mechanism for imparting ultrasonic vibration to a treatment liquid supplied or to be supplied to the substrate surface.

Claim 5 (Previously Presented)

A substrate treatment apparatus as set forth in claim 1, wherein the oxidation liquid supply mechanism supplies a treatment liquid comprising ozone water as the oxidation liquid to the substrate surface from the oxidation liquid nozzle.

Claim 6 (Previously Presented)

A substrate treatment apparatus as set forth in claim 1, wherein the oxidation liquid supply mechanism supplies a treatment liquid comprising hydrogen peroxide as the oxidation liquid to the substrate surface from the oxidation liquid nozzle.

Claim 7 (Canceled)

Claim 8 (Currently Amended)

A substrate treatment method for removing an unnecessary substance from a surface of a substrate, the substrate treatment method comprising the steps of:

supplying an oxidation liquid having an oxidative effect to the substrate surface for oxidizing metal impurities on the substrate surface;

physically cleaning the substrate surface; and

supplying an etching liquid having an etching effect to the substrate surface for etching the substrate surface after the oxidation step and the physical cleaning step,

wherein the physical cleaning step includes at least one of the following steps (a) and (b):

(a) a step of supplying a jet flow of droplets of a treatment liquid to the substrate surface from a dual fluid spray nozzle that blows a gas on the treatment liquid ejected toward the substrate surface to generate the jet flow of droplets,

(b) a step of imparting ultrasonic vibration to a treatment liquid supplied or to be supplied to the substrate surface;

wherein the physical cleaning step is carried out at least partly simultaneously with the oxidation step.

Claim 9 (Canceled)

Claim 10 (Original)

A substrate treatment method as set forth in claim 8, wherein the oxidation step, the physical cleaning step and the etching step are repeated a plurality of times.

Claim 11 (Previously Presented)

A substrate treatment method as set forth in claim 8, wherein the etching step is carried out for a period sufficient to etch away the metal impurities oxidized in the oxidation step.

Claim 12 (Canceled)

Claim 13 (Currently Amended)

A substrate treatment apparatus for removing an unnecessary substance from a surface of a substrate, the apparatus comprising:

an oxidation liquid supply mechanism for supplying an oxidation liquid having an oxidative effect to the substrate surface;

a physical cleaning mechanism including an ultrasonic mechanism for imparting ultrasonic vibration to a treatment liquid supplied or to be supplied to the substrate surface; and

an etching liquid supply mechanism for supplying an etching liquid having an etching effect to the substrate surface;

further comprising a cleaning controller for controlling the oxidation liquid supply mechanism and the physical cleaning mechanism to physically clean the substrate surface while supplying the oxidation liquid to the substrate surface.

Claim 14 (Canceled)

Claim 15 (Previously Presented)

A substrate treatment method as set forth in claim 8, wherein said oxidation liquid contains ozone water.

Claim 16 (Previously Presented)

A substrate treatment method as set forth in claim 15, wherein said oxidation liquid further contains an additive selected from the group consisting of hydrochloric acid, nitric acid and an organic acid.

Claim 17 (Previously Presented)

A substrate treatment method as set forth in claim 8, wherein said oxidation liquid contains hydrogen peroxide.

Claim 18 (Previously Presented)

A substrate treatment method as set forth in claim 17, wherein said oxidation liquid is SC-1 or SC-2.

Claim 19 (Previously Presented)

A substrate treatment method as set forth in claim 17, wherein said oxidation liquid further contains an additive selected from the group consisting of hydrochloric acid, nitric acid and an organic acid.

Claim 20 (Previously Presented)

A substrate treatment method as set forth in claim 8, wherein said etching liquid contains HF.

Claim 21 (Previously Presented)

A substrate treatment method as set forth in claim 20, wherein said etching liquid further contains HCl or H₂O₂.

Claim 22 (Previously Presented)

A substrate treatment method as set forth in claim 8, wherein said etching liquid contains NH_4OH or SC-1.

Claim 23 (New)

A substrate treatment method for removing an unnecessary substance from a surface of a substrate, the substrate treatment method comprising the steps of:

supplying an oxidation liquid having an oxidative effect to the substrate surface for oxidizing metal impurities on the substrate surface;

physically cleaning the substrate surface; and

supplying an etching liquid having an etching effect to the substrate surface for etching the substrate surface after the oxidation step and the physical cleaning step,

wherein the physical cleaning step includes a step of imparting ultrasonic vibration to a treatment liquid supplied to the substrate surface by bringing an ultrasonic vibrator into contact with a film of the treatment liquid that has been supplied to the substrate surface.

Claim 24 (New)

A substrate treatment method for removing an unnecessary substance from a surface of a substrate, the apparatus comprising:

an oxidation liquid supply mechanism for supplying an oxidation liquid having an oxidative effect to the substrate surface;

a physical cleaning mechanism including an ultrasonic mechanism for imparting ultrasonic vibration to a treatment liquid supplied to the substrate surface, the ultrasonic mechanism being arranged to bring an ultrasonic vibrator into contact with a film of the treatment liquid that has been supplied to the substrate surface; and

an etching liquid supply mechanism for supplying an etching liquid having an etching effect to the substrate surface.